

AMENDMENT UNDER 37 C.F.R. §1.111
U.S. Appl. No. 10/779,740

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (original): A nitride semiconductor substrate having a diameter of 10 mm or more, which has a single-layer structure composed of a nitride semiconductor layer having a basic composition represented by $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$), or a multi-layer structure comprising said nitride semiconductor layer, the mass density of said nitride semiconductor layer being 98% or more of a theoretical mass density $\rho(x)$ represented by the following general formula (1):

$$\rho(x) = \frac{4(M_x + M_N)}{\sqrt{3}a_x^2 c_x N_a} \dots \quad (1)$$

wherein $a_x = a_{\text{GaN}} + (a_{\text{AlN}} - a_{\text{GaN}})x$, wherein a_{GaN} represents an a-axis length of GaN, and a_{AlN} represents an a-axis length of AlN; $c_x = c_{\text{GaN}} + (c_{\text{AlN}} - c_{\text{GaN}})x$, wherein c_{GaN} represents a c-axis length of GaN, and c_{AlN} represents a c-axis length of AlN; $M_x = M_{\text{Ga}} + (M_{\text{Al}} - M_{\text{Ga}})x$, wherein M_{Ga} represents the atomic weight of Ga, and M_{Al} represents the atomic weight of Al; M_N represents the atomic weight of nitrogen; and N_a represents Avogadro's number.

2. (original): The nitride semiconductor substrate according to claim 1, wherein it is a self-supported substrate composed of said nitride semiconductor layer.

3. (original): The nitride semiconductor substrate according to claim 2, wherein said nitride semiconductor layer has a thickness of 200 μm or more.

AMENDMENT UNDER 37 C.F.R. §1.111
U.S. Appl. No. 10/779,740

4. (original): The nitride semiconductor substrate according to claim 1, wherein a distribution of said mass density is within $\pm 0.1\%$ in a plane.
5. (original): The nitride semiconductor substrate according to claim 1, wherein a distribution of said mass density is within $\pm 0.2\%$ in a thickness direction.
6. (original): The nitride semiconductor substrate according to claim 1, wherein said nitride semiconductor layer is composed of a single crystal.
7. (original): The nitride semiconductor substrate according to claim 1, wherein said nitride semiconductor layer has a threading edge dislocation density of $1 \times 10^7 \text{ cm}^{-2}$ or less.
8. (withdrawn): A method for producing the nitride semiconductor substrate according to claim 1, wherein said nitride semiconductor layer is grown by a hydride vapor-phase epitaxy method.
9. (withdrawn): The method for producing a nitride semiconductor substrate according to claim 8, wherein a nitrogen compound gas used as a starting material for said nitride semiconductor layer has a partial pressure of 50 kPa or more.
10. (withdrawn): The method for producing a nitride semiconductor substrate according to claim 8, wherein said nitride semiconductor layer is epitaxially grown on a different substrate.
11. (withdrawn): The method for producing a nitride semiconductor substrate according to claim 10, wherein the epitaxially grown nitride semiconductor layer is separated from the different substrate to provide a self-supported substrate of a nitride semiconductor.

AMENDMENT UNDER 37 C.F.R. §1.111
U.S. Appl. No. 10/779,740

12. (withdrawn): The method for producing a nitride semiconductor substrate according to claim 8, wherein after said nitride semiconductor layer is epitaxially grown, a heat treatment is conducted in an atmosphere containing a nitrogen compound gas.

13. (withdrawn): The method for producing a nitride semiconductor substrate according to claim 12, wherein said heat treatment is conducted at a pressure of 4 MPa or more.

14. (withdrawn): The method for producing a nitride semiconductor substrate according to claim 12, wherein a heat treatment temperature is 400-1200°C.

15. (new): The nitride semiconductor substrate according to claim 1, said nitride semiconductor layer being grown by a hydride vapor-phase epitaxy method.

16. (new): The nitride semiconductor substrate according to claim 15, wherein a nitrogen compound gas used as a starting material for said nitride semiconductor layer has a partial pressure of 50 kPa or more.

17. (new): The nitride semiconductor substrate according to claim 15, wherein said nitride semiconductor layer is epitaxially grown on a different substrate.

18. (new): The nitride semiconductor substrate according to claim 17, wherein the epitaxially grown nitride semiconductor layer is separated from the different substrate to provide a self-supported substrate of a nitride semiconductor.

19. (new): The nitride semiconductor substrate according to claim 15, wherein after said nitride semiconductor layer is epitaxially grown, a heat treatment is conducted in an atmosphere containing a nitrogen compound gas.

AMENDMENT UNDER 37 C.F.R. §1.111
U.S. Appl. No. 10/779,740

20. (new): The nitride semiconductor substrate according to claim 19, wherein said heat treatment is conducted at a pressure of 4 MPa or more.

21. (new): The nitride semiconductor substrate according to claim 19, wherein a heat treatment temperature is 400-1200°C.